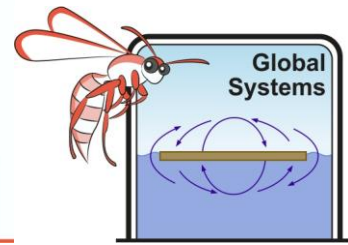
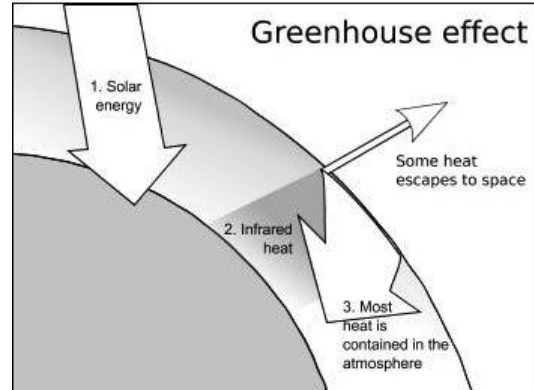


# Greenhouse Effect – Student Activity



Before our present atmosphere was formed, radiant heat from the Sun was directly reflected from Earth’s surface to be lost out into space. A slow build up of gasses created an atmosphere where heat was retained and life could exist.

Water vapour is the most important greenhouse gas in terms of volume and heat retention. Having a short residence time of four days in the atmosphere means that it must be constantly replenished by evaporation from the ocean. Although the three other main greenhouse gasses, carbon dioxide, methane and nitrous oxide are less present, they remain in the atmosphere for very much longer and therefore have a greater continuous heat trapping effect.



Gas	% of greenhouse gasses	% Produced naturally
1. Water vapour H <sub>2</sub> O	95.000%	94.99%
2. Carbon dioxide CO <sub>2</sub>	3.618%	3.502%
3. Methane CH <sub>4</sub>	0.360%	0.294%
4. Nitrous oxide N <sub>2</sub> O	0.950%	0.903%
5. Others	0.072%	0.025%

How does water enter the atmosphere? \_\_\_\_\_

\_\_\_\_\_

How does carbon dioxide enter the atmosphere? \_\_\_\_\_

\_\_\_\_\_

How does methane enter the atmosphere? \_\_\_\_\_

\_\_\_\_\_

How does nitrous oxide N<sub>2</sub>O enter the atmosphere? \_\_\_\_\_

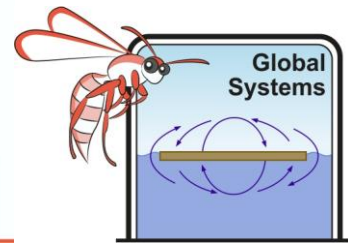
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Which style of graph or chart would best represent the relative percentages of different greenhouse gasses in the atmosphere?

Explain your answer. \_\_\_\_\_

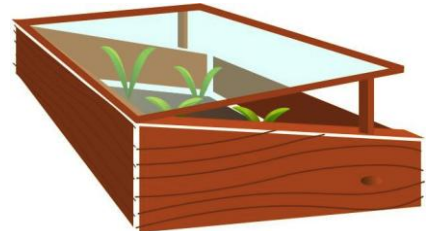
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## Greenhouse Effect – Student Activity



**Interesting fact** If atmospheric carbon dioxide levels rose from the present 0.03% to 1%, the surface temperature of Earth would rise to boiling point. The atmosphere of the planet Venus is 98% CO<sub>2</sub> and its surface temperature is 477°C

Heat affects how plants grow. Many cold climate gardeners and farmers extend the growing period and productivity of plants by placing seeds in a greenhouse, cold frame or cloche to encourage germination at an earlier date. In very cold countries such as Iceland where mid-summer temperatures may stay below 7°C, geothermal power is used to warm greenhouses so that the ground is warm enough to grow vegetables.



**AIM** To demonstrate the greenhouse effect.



Thermometers in greenhouse air, greenhouse soil and in open air

### Materials per student or group

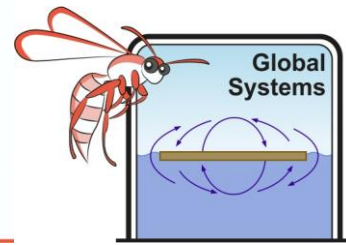
- A clean plastic cool drink bottle cut in half and one hole drilled in each half
- Two laboratory thermometers.
- A little plasticine or playdough to seal the thermometer holes in the half bottles
- Access to a garden bed or a laboratory tray with soil
- A sunny day will give the fastest results but a warm classroom window (radiant energy) will also give reasonable results

*Thermometers are delicate glass tubes and should be treated with respect. Never hold a thermometer by the bulb as this may affect later readings. Adjust your position so your eye is level with the top of the liquid in the thermometer to avoid parallax mistakes.*

### Method

1. Select an area of sunlit soil or fill a laboratory tray with moist soil and place in a sunlit location.
2. Cut a clean clear plastic bottle in half
3. Make a hole in the bottom half of the bottle. (See below for ideas).
4. Gently push the first thermometer through the hole in the bottom half of the bottle.
5. Set half bottle and thermometer safely upright in soil. The bulb of the thermometer should be in the air above the soil. Seal any gaps with plasticine or dough.
6. Place the second thermometer into the top of the half bottle and set it into the underlying soil. Gently adjust the position of the thermometer so that the bulb lies under the surface of the soil. Seal off the thermometer in the neck of the bottle with plasticine.

## Greenhouse Effect – Student Activity



7. The control thermometer should be held to read ambient air temperature.
8. Read the temperatures in the air, the air in the bottle and the soil in the bottles.
9. Record your data.

Hypothesise what will happen to the air temperatures inside and outside the flask. You may write this as an “If..... then .....” statement. An hypothesis is a scientific guess or estimate, which must be tested.



### My Hypothesis

If \_\_\_\_\_ then \_\_\_\_\_

---

### Results/observations

Time minutes	Control air temperature °C	Air temperature in greenhouse °C	Soil temperature in greenhouse °C
0			
5			
10			
15			
20			
25			
30			
35			
40			

Describe any other change inside the “greenhouses”? \_\_\_\_\_

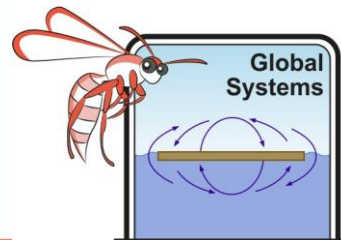
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### Conclusions

What did this data lead you to conclude? \_\_\_\_\_

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# Greenhouse Effect – Student Activity

## Discussion

Was your hypothesis supported? \_\_\_\_\_

Was your hypothesis proven? \_\_\_\_\_

How could this experiment be improved? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

What effect would the water vapour produced have on temperature in the greenhouse? \_\_\_\_\_

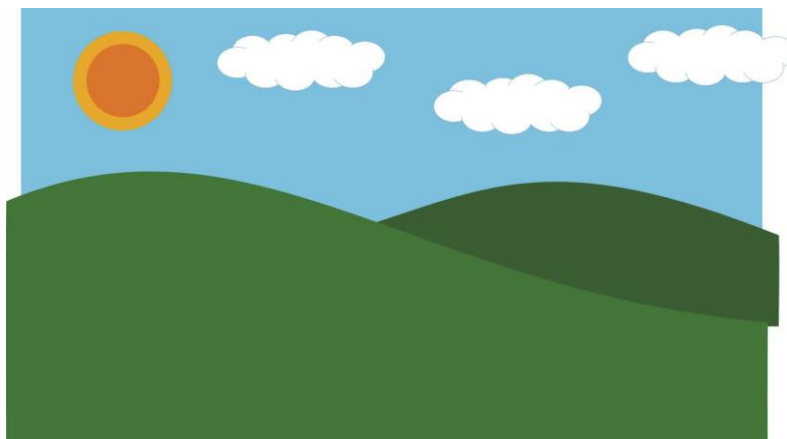
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## Recall

1. What is meant by the “Greenhouse effect”? \_\_\_\_\_

\_\_\_\_\_

Diagram: Draw the Sun’s rays and what happens because of the “greenhouse effect”.



2. Why should we be grateful that there are “greenhouse gasses” in our atmosphere? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. List the four main greenhouse gases from most common to least common.

\_\_\_\_\_

4. The “Enhanced Greenhouse Effect” or recent rapid warming of our atmosphere is the result of \_\_\_\_\_